User Manual

1. Safety:

a. General

i. **WEAR EYEGUARDS:** It is strongly recommended that eyeguards be worn by anyone using the Knight Trainer or standing on the court with the Knight Trainer. People near the Knight Trainer may be hit by shuttles returned by the player(s) using the machine.

ii. **POWER DOWN:** During examination, servicing or maintenance of the Knight Trainer, turn off the power switch and unplug the Knight Trainer.

iii. **USE ONLY AS INTENDED:** Only use the Knight Trainer to feed and eject regulation badminton shuttlecocks, whether nylon or feather.

iv. **USE SAFELY:** Do not operate the Knight Trainer with the transparent panels removed.

b. During setup or takedown

i. The stand

1. **LOWEST POSITION:** Be sure that the stand is in its lowest position.
2. **HANDLE WITH CARE #1:** Do not place your hands where they can be caught by the scissor action of the brackets as they open or close.
3. **HANDLE WITH CARE #2:** As the stand's legs close towards the outer shaft, do not place your hands where they can be caught by the legs.

ii. The Knight Trainer

1. **2 PEOPLE:** Although the Knight Trainer can be set up by one person, for some people it can be difficult to lift alone onto the stand. When in doubt, or until experienced, 2 people should work together. The main unit weighs 52 lbs (23.7 kg) and has to be lifted to a height of about 40" (102 cm).
2. **WATCH YOUR STEP:** Make sure that the area around the Knight Trainer is clear so as to avoid stumbling while handling the unit.
3. **FIRM GRIP:** Whether working alone or with someone else, be very sure of your grip on the Knight Trainer while either positioning it on the central shaft of the stand, or removing it from the stand.

c. During operation of the Knight Trainer

1. Wear eyeguards.
2. Use an extension cord of sufficient length (see section 2)
3. Unless otherwise instructed, unplug the Knight Trainer from the power supply before any examination of, or contact with, the feeding and ejection mechanisms
4. Do not stand directly in front of an operating Knight Trainer.
5. Do not lean on the Knight Trainer.
6. Turn off the feeding mechanism before inserting or removing a tube containing shuttlecocks.

2. Electrical requirements

Canada, United States and other countries with 110V electrical standard:

- The Knight Trainer operates at 110V, 50-60 Hz, 5 Amps, which is standard in Canada, the US and many other countries. No special attention is required if you are plugging the Knight Trainer into a power supply 110V or lower.

- For countries with higher voltages (such as 220V, 230V and 240V), ***a transformer is required***. A compact 500W transformer is supplied with Knight Trainers shipped to countries where it is necessary.

Direct use of higher voltages will damage the Knight Trainer's circuit board and repairs will not be covered by the warranty.

In all cases you will need an appropriate extension cord long enough to reach from an electrical outlet to the net while lying flat on the court floor for the whole distance. This extension will be connected to the power cord supplied with the Knight Trainer and will allow you a full range of positions on the court.

If you are using a transformer, the transformer should be located at the electrical outlet.

The remote control requires 2 AAA batteries (one pair of batteries is included).

3. Shuttlecocks and shots

What kind of shuttlecocks can be used with the Knight Trainer?

The Knight Trainer works with nylon and feather shuttlecocks with cork bases.

In tests and through reports from users, we have found satisfactory performance with many brands of ***feather*** shuttlecocks. If the shuttlecock is durable in normal play or training then it will be similarly durable when used with the Knight Trainer.

The Knight Trainer also performs very well with ***nylon (synthetic)*** shuttlecocks. However, the corks of some brands are not securely attached to the nylon cage and may separate with use. Therefore, ***the Black Knight synthetic models Truflight 3000 and Truflight 4000 are strongly recommended for use with the Knight Trainer.*** These models have been designed with the Knight Trainer in mind, and will last much longer than many other brands, while offering top level playability.

Will the Knight Trainer work with used shuttlecocks?

The Knight Trainer works very well with used shuttlecocks as long as their condition will allow them to feed properly. Feather shuttlecocks with broken feathers are more likely to snag another shuttle, in which case two might be ejected together.

Bear in mind that shot quality and shot consistency are best with shuttlecocks in good condition. Shuttles in bad condition are best for drills where accuracy is not as important.

Should feather shuttlecocks be humidified?

For longest life, feather shuttlecocks should be humidified. With the Knight Trainer, you can use various means to humidify shuttles in their original shuttle tubes and then transfer to the Knight Trainer's feeding tubes. You can also keep a damp sponge in the cap of the Knight Trainer tubes to maintain humidity for the shuttles inside. ***Do not steam*** directly into the Knight Trainer's feeding tubes, as the heat may damage the tubes.

Will the Knight Trainer damage the shuttlecocks?

The Knight Trainer ejects the shuttles by grabbing the cork and makes minimal contact with the feathers or nylon cage, so damage to the cage by the Knight Trainer is very rare for most shots. Shuttles will be damaged by players hitting the shuttles, as is normally the case in play or training. Feather shuttles will always last longer if humidified.

You will see signs of wear on the cork, such as abrasion and wearing away of the cork's cover, and some compression of the cork. These changes do not affect flight.

Due to the compression of the cork, some corks may eventually break while the feathers or nylon are still intact. If there is persistent cork breakage, this may require increasing the wheel spacing in order to reduce the pressure on the cork (refer to the troubleshooting section) or changing the brand or model of shuttlecock being used (see 3 above concerning nylon shuttlecocks).

Can the Knight Trainer automatically change shots?

The Knight Trainer will randomly vary the direction of a given shot using the Randomizer feature, but it cannot automatically change shots. When the Randomizer is turned off, the Knight Trainer is set for a particular shot and will repeat that shot with a small range of variability in the trajectory. The Knight Trainer has been designed to offer a steady repetition of quality shots. Coaches and players of all levels can take advantage of this to improve and increase their repertoires of shots, and to steadily improve accuracy in placement.

- With the Randomizer turned on, and with some attention to positioning, then the Knight Trainer will deliver an unpredictable spread of the chosen shot left and right across the court.
- 2 Knight Trainers can be connected in order to set up alternating shots, including shots with the Randomizer, depending on the shots that have been chosen.

4. Setting up the Knight Trainer

The complete Knight Trainer kit includes:

- The main Knight Trainer unit containing the feeding and ejection systems and the Randomizer
- A power cord to plug into the Knight Trainer's control panel and to connect to the user's own extension cord
- A wheeled Knight Trainer bag in which the Knight Trainer can be transported locally. This bag alone is not intended to protect the Knight Trainer during shipping or baggage handling. For those purposes, keep and re-use the original foam pieces and the shipping carton in which the Knight Trainer was delivered to you.
- A three legged, adjustable height , wheeled stand
- A carrying bag for the stand

- Three 50” (1.27 m) tubes to hold approximately 50 shuttlecocks each. Each tube includes:
  - An exit cap, already in place, and shaped to allow the shuttles to be drawn from the tube.
  - An end cap, which closes the opposite end of the tube.
- A carrying bag for those tubes
- A weighted ball for the shuttle tube that is in use
- Three pairs of eyeguards
- Two remote controls (one being a spare), including 2 AAA batteries and a small nylon drawstring bag to store the control (this can conveniently be hung from one of the stand’s knobs).

a. Knight Trainer’s Stand (weight 14.5 lbs /6.6 kg)

(Steps with * are only applicable the first time the stand is used)

i. *Remove the stand from the box, including the plastic bag containing three wheels and a wrench.
ii. There are two collars on the outer shaft, each with a locking knob (A and B). Turn each knob counterclockwise to ensure that the collars will move freely on the outer shaft.
iii. Turn the stand upside down. *Some force will be required initially to release each leg from the position in which it was packed, in order to expose the threaded holes into which the wheels will be screwed
iv. *Use the wrench to screw a wheel into each threaded hole.
v. Place the stand, wheels down, on the floor.
vi. Press down on the upper collar and allow the three legs to spread outwards.
vii. When the legs are fully extended, adjust the outer shaft so that the bottom of the shaft is about 1” (2.5cm) off of the floor.
viii. Tighten the locking knob (A and B) on each collar

b. Knight Trainer main unit (feeding/ejection assembly)

Although compact, the Knight Trainer’s main unit weighs 52 lbs (23.7 kg) and must be lifted to a height of about 40" (102 cm) to place it on the Knight Trainer's main stand. Therefore it is best to have two people installing the Knight Trainer on the stand or removing it.

i. Ensure that the stand is at its lowest position.
ii. Ensure that the angle locking knob (see picture below) has been tightened so that the Knight Trainer will not rotate on the main bracket.
iii. Depress the levers on the tripod wheels to lock the wheels into position so that the stand will not roll during installation.
iv. Ensure that the power cord is not plugged into the Knight Trainer.
v. Grasp the Knight Trainer by the handle and by the main bracket - ***do not grasp the Knight Trainer by the polycarbonate covers.***
vi. Lift the Knight Trainer and position the main bracket’s cylinder above the top of the stand’s central shaft.
vii. Lower the Knight Trainer so that the bracket’s cylinder descends over the central shaft and the Knight Trainer settles into position.
viii. Loosen the angle locking knob and change the angle appropriately
ix. Unlock the stand’s wheels so that the Knight Trainer can be easily moved around the court.

c. Shuttlecock feeding tubes

i. The tubes are ready for use as delivered. Please see the following section for more details.
ii. When placing the tubes on the Knight Trainer ensure that they are fully inserted. See below for more details.
iii. When removing a tube, push upwards on the exit cap to release it from the metal collar. Then lift the tube out of the collar.
iv. Note that the tubes should not be exposed to temperatures over 75°C (170°F) or they may soften and become misshapen. Therefore do not apply steam to shuttles in the feeding tubes, and do not leave them where they can be exposed to such temperatures.

5. Operating the Knight Trainer

a. Inserting and removing the tube of shuttlecocks

The Knight Trainer is delivered with 3 tubes to hold shuttlecocks. These tubes can each hold approximately 50 nylon or feather shuttles.

i. Ensure that the feeding mechanism is turned off. The ejection motors can remain powered up.
ii. The provided ball can be placed inside the tube at the top of the stack of shuttles to ensure sufficient weight to press the last few shuttles into position, especially when the tube angle is farthest from vertical.
iii. Lower the tube, with the cork end of the shuttlecocks facing down, through the tube bracket
iv. Ensure that the tube is seated as far into the bracket as possible. If necessary, give the tube a few twists clockwise and counter-clockwise while applying gentle downward pressure and the tube will quickly settle into place.
v. When removing a tube, push upwards on the tube's exit cap to release it from the metal collar. Then lift the tube out of the collar. Twist the tube if necessary.

b. Powering up, shutting down

i. The power inlet is located on one side panel of the Knight Trainer. The same side panel includes the angle reader, angle locking knob and digital readout. Connect the provided power cord to the power inlet. Use an extension cord to connect the provided power cord to a live electrical outlet. For safety reasons, ensure that the extension cord is long enough to lie flat on the floor for all shot positions.
ii. The on-off switch located on the side panel will power up or shut down the Knight Trainer.
iii. If you change digital settings and want to retain those changes after turning off the power, be sure that the feeding mechanism has been turned on and then off, with or without shuttles, after the changes. This step will memorize the settings.
iv. When the power is turned on:
    1. The two ejection wheels will start rotating at the last memorized velocity setting.
    2. The feeding mechanism will not start up until activated with the remote control.
    3. The digital readout will show the last saved frequency and velocity settings (see 5.b.iii).

c. Interpreting the settings

i. Frequency

1. Frequency refers to the rate at which shuttles are fed to the ejection system. The number displayed on the digital readout refers to the interval between feedings.
    a. The higher the number, the longer the interval (more time between shots).
    b. The lower the number, the shorter the interval (less time between shots)
    c. At a setting of 4, the interval is one second between shots. At 1, the interval is 0.4 seconds between shots, which means 2.5 shuttles are ejected per second.
    d. The slowest interval setting is 35, which equates to 1 shot per 16.5 seconds.
    e. A full conversion chart appears in section 8, and on each of the court outline pages. It can also be found on the side of the Knight Trainer.

ii. Velocity

1. Velocity refers to the speed at which the shuttle is ejected from the Knight Trainer. The velocity readout does not show an actual speed, but allows the user to note the number used for a specific shot, and to then return to that number at another time for the same ejection speed.
2. The lower the number, the slower the ejection speed. The higher the number the faster the ejection speed.

iii. Height

1. The numbers appearing on the stand's shaft can be noted so that you can quickly set up the same shot at another time. To avoid damage, do not go past the maximum indicated on the shaft.

iv. Angle

1. The angle readout indicates the inclination of the Knight Trainer's ejection point, whether pointing upwards to a positive angle, level, or downwards at a negative angle.
2. Due to the aerodynamics of the shuttlecock as it is ejected, the shuttle leaves at a rising trajectory when the Knight Trainer is level. Therefore, for a level trajectory, it may be necessary to angle the ejection point downwards. The exact negative angle will vary depending on what kinds of shuttles are being used, and the velocity of the ejection.

d. Controlling the Knight Trainer

i. Remote control

1. The remote control receiver is most sensitive to signals coming from points in front of the Knight Trainer, with the signal is directed towards the receiver on the control box above the left wheel.
2. From the side of the machine, facing the readout, you can also use the remote control to affect the settings by holding the remote up to the readout panel and pushing the appropriate buttons on the remote. You may have to try a couple of positions for the remote control until you find the proper point.
3. From the side you can also reach in front of the Knight Trainer below the motors and change settings with the remote.

ii. Feeding mechanism

1. With the main power on, activate or stop the feeding mechanism using the top right button on the remote control.
2. When the feeding mechanism is activated:
   a. A steady light will shine from the signal receiver at the front of the Knight Trainer's control box.
   b. On the Knight Trainer's display, 4 dots will light up below the digits.

These lights will all turn off whenever the feeding mechanism is turned off, whether with the remote control or with the main power switch.

iii. Frequency

1. With the main power on, use the remote control's CH+ and CH- buttons to decrease or increase the interval between shots.
2. When first feeding at the shortest interval setting (an interval of 1) the Knight Trainer will need to accelerate the rate of ejection during several shots before reaching and continuing at the highest frequency.

3. You can adjust the frequency while the Knight Trainer is feeding and ejecting shuttles, or while the feeding is turned off.
4. When making changes the signal light on the receiver will flicker with each button push to confirm that a change has been made.

iv. Velocity

1. With the power on, use the remote control's V+ and V- buttons to increase or decrease the velocity.
2. You can adjust the velocity while the Knight Trainer is feeding and ejecting shuttles, or while the feeding system is turned off.
3. When making changes, the signal light on the control box will flicker with each button push to confirm that a change has been made.

v. Height

1. Use the hand crank to reach the desired height for the shot being practiced.
2. To avoid damage, do not go past the maximum indicated on the shaft.
3. Once set up, note the number appearing on the shaft of the stand so that you can quickly set up the same shot at another time.

vi. Angle

1. With the angle locking knob relaxed, tilt the head to the desired angle.
2. Once set up, note the angle shown on the indicator so that you can quickly set up the same shot at another time.

vii. Direction

1. The Knight Trainer can easily be pivoted on the stand to the left and to right. Do so to set the placement of the shot being practiced, or to vary shot directions while another player trains.

6. Using the Randomizer

The Randomizer creates random shots to the left and right of the main shot, with no hint of the direction until the shuttle leaves the Knight Trainer. The Randomizer can operate at all the Knight Trainer frequency settings, right up to 2.5 per second (frequency setting of 1).

The Randomizer is not programmable. It is either on or off. If using the Knight Trainer with the Randomizer turned off, the two poles of the Randomizer must be centered so as not to deflect the shuttlecocks. Instructions for centering appear below and in the installation section.

The Randomizer has its own power button. When it is on, the two poles will move rapidly from side to side, randomly directing the shuttlecocks that are leaving the Knight Trainer. There is no remote control function for the Randomizer.

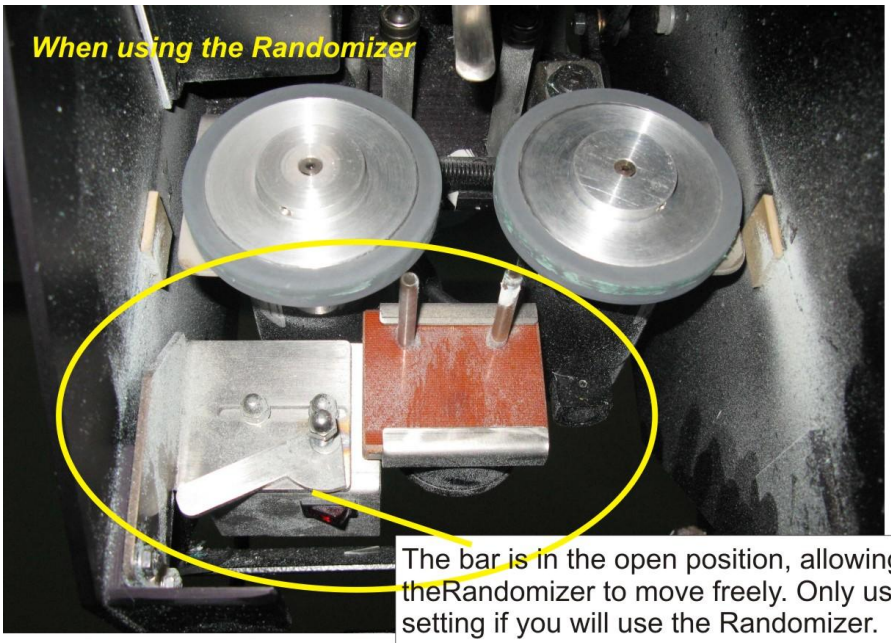
To start and stop the Randomizer

To start

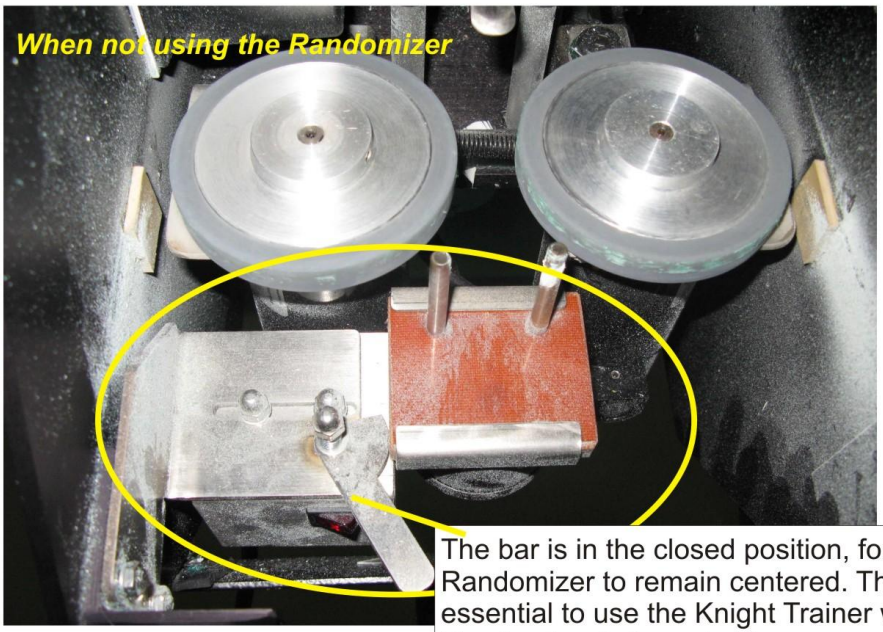
- Ensure that the feeding mechanism is off.
- Rotate the bar to the left (clockwise) to the open position so that the bar will not block the action of the Randomizer
- Push the Randomizer power button to the on position.
- Stand to the side of the Knight Trainer and, when ready, turn on the feeding.

To stop

- Rotate the bar counterclockwise to the closed position, blocking the Randomizer's movement. There will be some noise as the Randomizer hits the bar, but don't be concerned. Turn off the Randomizer's power switch. Push the red rectangle against the bar to ensure that the Randomizer is properly centered.



The bar is in the open position, allowing theRandomizer to move freely. Only use this setting if you will use the Randomizer.



The bar is in the closed position, forcing the Randomizer to remain centered. This is essential to use the Knight Trainer when the Randomizer is turned off.

With the Randomizer turned off and centered, you can now use the Knight Trainer for the full range of straight shots at all speeds and angles and from all normal locations.

Setting up shots with the Randomizer

- Start with the Randomizer turned off and centered.
- Place the Knight Trainer on the centre line of the court, and set up the Knight Trainer for a shot along the centre line such as a clear, smash, drop shot or drive.
- When turned on, the Randomizer will allow some shuttles to go straight, and will randomly send the rest of the shots to the left and right. Shots will leave at angles of up to about 15 degrees to the left and to the right of the centre. Therefore, the further the shuttlecock travels the wider the spread of the shots.
- The player cannot detect the direction of the shuttle until the shuttle leaves the machine, making this an exceptional training tool for reflexes, speed, footwork and stamina.

To note:

- The distance is set with the basic shot down the centre. The shuttle will travel further back in the court down the middle than towards the corners.
- The Randomizer works best at medium to high velocities and is not ideal for shots launched at low speeds, such as net shots. However the Randomizer can be used for drop shots from the back of the court, creating a very challenging range of shots in front of the short service line. Other shots that can be faced by the player are smashes, clears, drives or smash returns.
- There will be some velocity changes with the random shots which will add to the unpredictability and the challenge to the player.
- At some frequencies the randomizer will not seem to work because its oscillations have synchronized with that frequency setting. When this happens, go up or down one frequency setting and performance should return to normal.

With the Randomizer turned off and centered, the Knight Trainer can be used for shots continuously to one location.

7. Using 2 connected Knight Trainers

Two Knight Trainers can be connected by a special cable allowing them to operate in a coordinated way.

- Each Knight Trainer is positioned for its desired shot – angle, height , frequency and velocity are all set
- One Knight Trainer will act as the Leader.
    - The frequency on the Leader sets the time between each shot from the Leader. This is equal to the total cycle time for the Knight Trainers working together.
    - The other Knight Trainer will act as the Follower. The frequency on the Follower ***must be less than on the Leader***. This frequency will determine how long after a shot from the Leader the Follower will launch a shuttlecock.
    - For example, set the Leader to launch every 4 seconds and set the Follower to launch every 1.5 seconds. As a result, approximately 1.5 seconds after every shot from the Leader, there will be a shot from the Follower. The next shot from the Leader will be approximately 2.5 seconds after the Follower, since the total cycle time was set at 4 seconds (1.5 seconds + 2.5 seconds).

- Example of usage: The Leader feeds a short clear, which the player can smash. The Follower will then simulate a loose smash return blocked to the net, which the player must attack. The Leader will then send another short clear to be smashed, followed by another loose smash return from the Follower. The cycle continues until all the shuttles have been used up. Adjust the timing and the shots to create the right level of difficulty to challenge any player. Since two machines are in use, up to 100 shots can be played before reloading.

8. Shot suggestions and shot setup

A wide range of badminton shots and drills can be created with the Knight Trainer by varying the location on the court, the height, the angle, the frequency and the velocity, and the number of players involved. Below are a few suggestions, but users will develop their own shots and training routines.

The Randomizer can be used to vary shot direction to the left and right, or a coach can manually change the position, settings and orientation of the Knight Trainer while it is in use. When shots will be varied left and right it is best to operate the Knight Trainer from the centre line.

Videos of many drills can be seen at:
http://youtube.com/user/BKBADMINTON and www.KnightTrainer.com

Also refer to the Training section further on in this binder for more detailed explanations of how to set up your Knight Trainer.

i. Smashes

1. Move the Knight Trainer towards the front of the service box, or go closer to the net to create more difficult shots.
    a. The closer to the net that the Knight Trainer is positioned, the more difficult the smash.
    b. For crosscourt smashes, position the Knight Trainer near one side line and rotate the Knight Trainer to aim crosscourt.
    c. For straight smashes, position the Knight Trainer anywhere on the court and aim straight ahead.
2. Raise to height suitable for the shot being created
3. Adjust velocity and angle until you have created the type of smash that you would like to practice.
4. Set to a frequency appropriate for the level of the player and the type of shot being practiced, taking into account how the player will be moving during the drill.

ii. Drives

1. These will be similar to smashes with appropriate adjustments made to position, height, angle, frequency and velocity in order to create the desired training. Once you have a trajectory that you like, tighten or loosen the drives relative to the net by adjusting the height of the Knight Trainer rather than the angle.
2. Set to a frequency appropriate for the level of the player, the extent of movement, and the type of shot being practiced

iii. Drop shots

1. Position the Knight Trainer along the back doubles service line
    a. For crosscourt drop shots, position the Knight Trainer near one side line and rotate the Knight Trainer to aim crosscourt.
    b. For straight drops, position the Knight Trainer at a sideline, and aim straight towards the net.
    c. If someone will manually vary the placement of the drop while a player trains, place the Knight Trainer at the center of the service line. Set up the Knight Trainer to send a drop to one corner, and the same settings will produce a good drop shot to the other corner just by swiveling the head between shots.
2. Raise to maximum height
3. Adjust velocity and angle until you have created the type of drop shot that you would like to practice.
4. Set to a frequency appropriate for the level of the player, the extent of movement, and the type of shot being practiced

iv. Clears

1. Depending on the height and depth of the clear you wish to practice, place the Knight Trainer anywhere from the net to mid court.
2. Adjust height, velocity and angle until you have created the type of clear that you would like to practice.
    a. The higher the height adjustment, the higher and deeper the clear will be.
    b. Rolling the Knight Trainer closer or further from the net is a quick alternative to changing the velocity to adjust the depth of the shot.
3. Set to a frequency appropriate for the level of the player and the type of shot and movement being practiced

v. Net shots

1. Move the Knight Trainer to a point near the net.
    a. For crosscourt net shots, position the Knight Trainer near one side line and rotate the Knight Trainer to aim crosscourt.
    b. For straight net shots, position the Knight Trainer and aim straight ahead.
2. Work from minimum height or slightly above.
3. Adjust position, velocity and angle until you have created the type of net shot that you would like to practice.
    a. The optimum angle will not be the same for straight net shots versus cross court shots. For straight shots you will probably find that the maximum angle is best, whereas for crosscourt shots you will need a lower angle to get more distance without sending the shot too high.
4. Set to a frequency appropriate for the level of the player, the type of shot being practiced and the court movement required.

vi. Short serves

1. Move the Knight Trainer into a service box.
2. Lower to minimum height
3. Adjust velocity, angle, position and direction for the kind of short serve you want to create.
4. Set to a frequency that will allow enough time for a player to return a serve, go back to the receiving position and prepare for the next shot.

9. Frequency Conversion Chart

DISPLAY READING	EJECTION INTERVAL			DISPLAY READING	EJECTION INTERVAL	
1	0.4	seconds		19	8.5	seconds
2	0.5	seconds		20	9.0	seconds
3	0.67	seconds		21	9.5	seconds
4	1.0	second		22	10.0	seconds
5	1.5	seconds		23	10.5	seconds
6	2.0	seconds		24	11.0	seconds
7	2.5	seconds		25	11.5	seconds
8	3.0	seconds		26	12.0	seconds
9	3.5	seconds		27	12.5	seconds
10	4.0	seconds		28	13.0	seconds
11	4.5	seconds		29	13.5	seconds
12	5.0	seconds		30	14.0	seconds
13	5.5	seconds		31	14.5	seconds
14	6.0	seconds		32	15.0	seconds
15	6.5	seconds		33	15.5	seconds
16	7.0	seconds		34	16.0	seconds
17	7.5	seconds		35	16.5	seconds
18	8.0	seconds				

10. Storing the Knight Trainer

a. Power

i. Turn off the Knight Trainer and then unplug the Knight Trainer from the electrical source***. If using a voltage transformer, turn off and disconnect the Knight Trainer before turning off the transformer.***

b. Shuttlecock tube

i. Remove the tube from the Knight Trainer by pushing upwards at the bottom to release the bottom cap from the metal holder.
ii. Place shuttles into the tube as necessary and then place the end cap on the tube.
iii. Place end caps on the other tubes if they contain shuttles.
iv. Place all tubes into the tube bag, with the capped end at the bottom unless you are keeping a damp sponge in the cap.
v. The tube bag has a small pocket near the handle which can be used to store the remote control.
vi. Do not store the tubes near a source of heat as the plastic may soften.

c. Knight Trainer main unit (feeding/ejection assembly)

i. Set the stand to its lowest point.
ii. Depress the levers on the tripod wheels to lock the wheels into position.

iii. Loosen the angle locking knob and tilt the Knight Trainer forward until the angled bottom at the front touches the support bracket (refer to the photo in section 4).
iv. Tighten the angle locking knob.
v. If you have tightened the knob on the cylinder that fits over the central shaft of the stand, loosen that knob now.
vi. Due to the weight of the Knight Trainer and the height at which it is positioned, it may be best to have two people remove it from the stand.
vii. Be careful not to grasp the Knight Trainer by the polycarbonate covers.
viii. Grasping the Knight Trainer by the handle, and by the main support bracket or other metal part, lift the Knight Trainer from the stand
ix. Lower the Knight Trainer to the floor or directly into the transport bag.
    1. In the transport bag, stand the Knight Trainer so that the back of the unit is towards the wheeled end of the bag.
    2. Lie the Knight Trainer on its side so the angle locking knob is facing upwards.

d. Knight Trainer's Stand

i. With the stand adjusted to its lowest point, loosen (counterclockwise turn) the locking knob on the upper collar.
ii. Turn the stand upside down so that the wheels on the three legs are facing upwards, with the flat top of the central shaft now on the floor. Press the legs towards the shaft or press the central collar downwards, taking care to keep fingers and hands away from the closing mechanisms.
iii. When it will not close any further, loosen the other locking knob and continue closing the legs.
iv. Once the legs are fully closed against the outer shaft tighten the knob at that end of the shaft.
v. Insert the stand into the stand bag. The stand bag has a triangular cross section, so align the wheels with the seams as you lower the stand into the bag.

11. Adjustments and Maintenance

The Knight Trainer should be handled carefully and not dropped, crushed or exposed to liquids. However,, the components and structure have been designed for high reliability and very long life with proper use.

The Knight Trainer's feeding and ejection mechanisms do not require any regular maintenance, but the ejection wheels themselves will require attention from time to time.

The user may also decide to clean the polycarbonate front or back covers, which is also described in this section.

These tools may be required for adjustments or maintenance:

Wheel spacing
- 3/8" wrench to release the locking nut on the bolt that sets the wheel spacing
- 7 mm wrench to adjust the bolt that sets the wheel spacing

Removing or installing the ejection wheels
- 3/32 hex key for the set screws on the wheels

Re-tightening the angle locking mechanism
- 7/32" hex key to retighten the bolt

Removing or reinstalling the polycarbonate panels

1/8” hex key for the screws that hold the polycarbonate panels in position (same as for the box below.

Removing or installing the control box

1/8” hex key (same as for the panels above).

Detaching or attaching the cam shaft in order to access the control box

5/32” hex key

In this section you will learn more about situations that will require using some of the above tools. More information will be added to later versions of this manual.

The ejection wheels:

i. Residue

1. Some residue from the shuttles may build up on the ejection wheels of the Knight Trainer. Often this residue will fall off on its own, or can be removed by rubbing the stationary wheels with a fingertip, causing the residue to separate from the wheels. When more attention is needed: :
   a. Allow the wheels to spin at a low speed in the 25-35 range
   b. **Angled towards the sides of the Knight Trainer**, hold a rubber eraser block first against one spinning wheel and then the other, with gentle pressure, allowing the contact to remove the buildup. There is a risk of injury if you angle the block towards the space between the wheels. Therefore, be <u>sure to angle the block towards the right side when doing the right wheel and towards the left side when doing the left wheel</u>. If in doubt, test the process at a speed of 5-10.
   c. Whatever you may use against the wheel, remember that the goal is to remove any buildup and not to abrade or roughen the wheel. Do not use any liquids to clean the wheels.

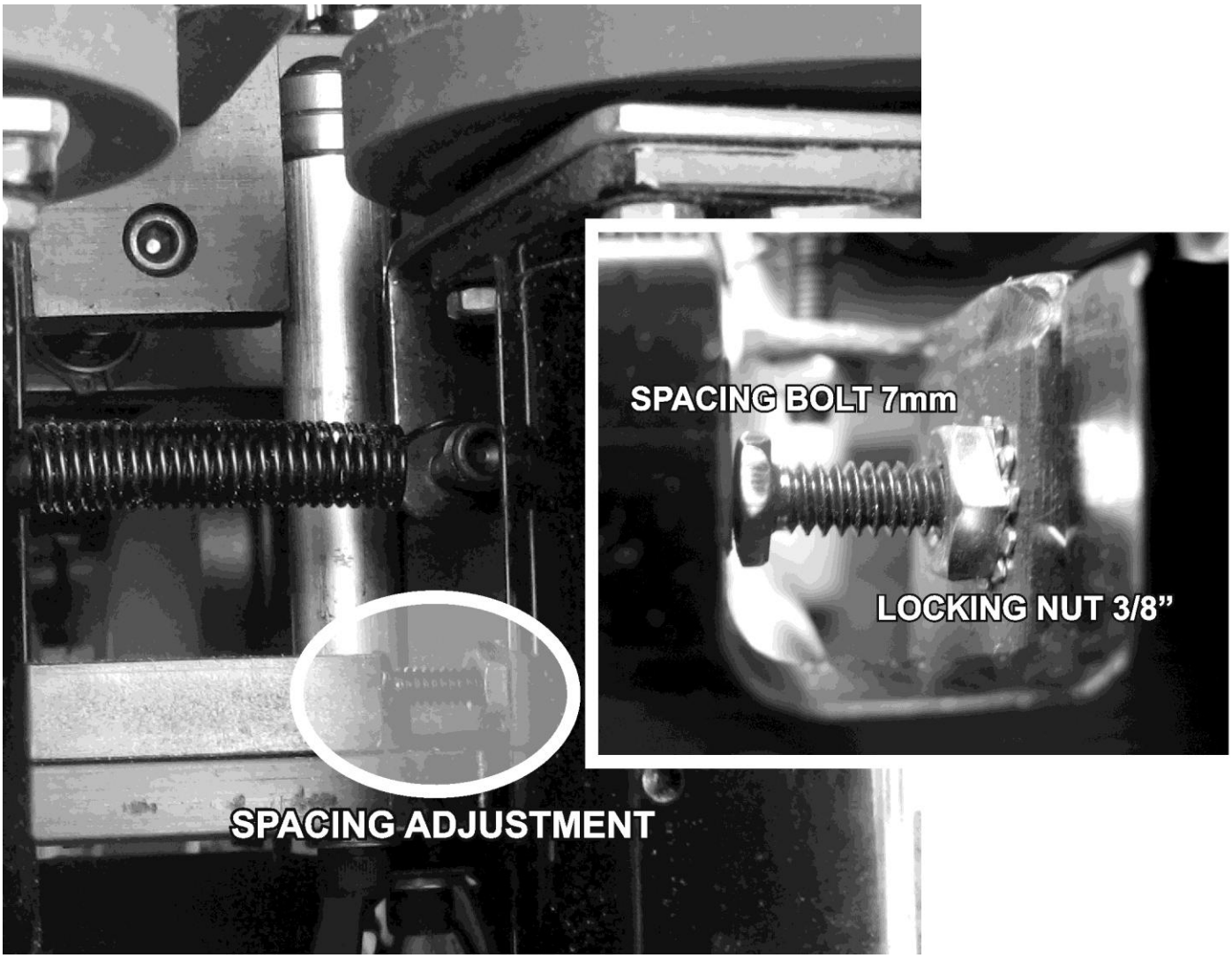
2. The standard spacing between the wheels is 21.5mm. This spacing is an important part of the operation of the Knight Trainer. If the space is too large, accuracy and top velocity will be affected. With too small a space there may be damage to the cork.

   The position of each wheel is determined by a small bolt, located behind and below the wheel. The bolt is locked in place by a locking nut.

   To adjust the spacing you will require:
   a. A spacer (provided) to establish the standard spacing and to centre that space relative to the feeding mechanism.
   b. 2 wrenches:
      a. 3/8 inch to loosen the locking nut on the bolt that sets the spacing
      b. 7mm to adjust the bolt and therefore the spacing

i. Turn the bolt counterclockwise to increase the spacing
ii. Turn the bolt clockwise to reduce the spacing

c. When finished, tighten the locking nut



ii. Replacing a wheel

1. The rubber compound used for the ejection wheels is very long lasting, and the spacing between the wheels can be reduced to compensate for wheel wear, adding even further to wheel life. Nonetheless, at some point it may be necessary to change the wheels.

   Each wheel is held in place with a set screw, ***applied against the flat face of the shaft***, that can be removed with a hex key. When new wheels are installed, the same screws are tightened against the flat side of the shaft to lock the wheels onto the drive shafts.

   To install a wheel:

   a. Note that the shaft on which the wheel fits has a flattened part. Align the wheel so that the set screw is directed towards the flattened part of the shaft.

b. Before tightening, raise the wheel so that the top of the wheel is flush with the top of the shaft. This is very important to allow the wheels to spin freely and to allow the shuttles to be properly delivered between the wheels.

Cleaning the polycarbonate covers:

Polycarbonate is a very strong material when resisting impact, but is easily scratched. Clean only with a soft, non-abrasive cloth, such as a microfibre cloth intended for eyewear. Do not use cleaning agents unless they are specifically identified as being suitable for polycarbonate. Stores that sell eyeguards will often also carry cleaning products intended for polycarbonate.

Do not spray directly onto the panels. Instead spray onto the cleaning cloth.

The angle locking mechanism:

Normally we loosen the angle locking knob before an angle change and then tighten the knob to lock the chosen angle.

i. If you do not loosen the knob before changing the angle, the knob may become too tight to adjust. In such a case, rotate the head clockwise and the knob will loosen. Loosen the knob further, make the angle adjustment, and then tighten the knob.

ii. If you don't feel that the knob tightens enough as you turn it clockwise:
   a. Go to the other side of the Knight Trainer where you will see that there is no knob at the pivot point. However, you will see a bolt in that position. Inside the Knight Trainer you will see a nut on that bolt.
   b. Loosen the nut with a wrench and then
      i. If the angle rotation of the Knight Trainer seems too tight, use the 7/32" hex key to loosen the bolt slightly by turning it counter clockwise. If the Knight Trainer's angle rotation seems too loose, turn the bolt clockwise to tighten.
   c. Tighten the nut

12. Warranty – 24 months from delivery

In the event of a problem that the owner cannot resolve:

- The first step will be to attempt to fix the problem using telephone or e-mail support, with parts provided as necessary by Black Knight (see page 2 for contact information).
- If the problem cannot be resolved in the above manner, the vendor will either provide on-site support, if available, or will arrange for the Knight Trainer to be returned to a service centre, subject to the terms of the warranty.
- Any damage or malfunction due to mis-handling of the Knight Trainer is not covered under this warranty.
  Examples:
  - Allowing the Knight Trainer to become wet
  - Dropping the Knight Trainer
  - Using the Knight Trainer to eject objects other than regulation shuttlecocks.
  - Not using the appropriate power transformer when connecting the Knight Trainer to power sources other than 110V.

First year:
The Knight Trainer is guaranteed against any failure of parts, or any sustained malfunction, as long as the

Knight Trainer has been properly used. Guarantee includes the costs of parts, transport* if necessary from the delivery point (or equivalent) to a service center, and any labour charges at the service centre.

Second year:
Guarantee includes the costs of parts and any labour charges at the service centre. Black Knight pays shipping to the customer up to CAD100 per incident, or pays the cost of shipping back to the customer anything authorized to be shipped to Black Knight, whichever is greater. The customer is responsible for the costs of shipping to Black Knight.

Anything shipped back to Black Knight must be properly packed to avoid damage in transit as the sender will be responsible for damage in transit.

*A limit on transport costs may be placed at the time of purchase for points with unusually high shipping costs.

The paid warranty extension option provides the same coverage as the original second year guarantee.

12. Troubleshooting

Feeding system:
The Knight Trainer has been designed to operate with nylon and feather shuttlecocks with cork bases, both new and used, and of standard size. However, shuttlecocks are not perfectly consistent from one to another, and from one brand to another. Variations in shuttles can affect consistent feeding or shuttlecock durability.

Also bear in mind that bad shots result if shuttles are stuck together in the feeding tube. This can happen, for example, if feather shuttles are pushed directly from a shuttle tube into the feeding tube without separating the shuttles. The solution is simply to separate the shuttlecocks as you fill the feeding tube.

- **Misfeeds:** From time to time the Knight Trainer will need several attempts to grab and feed a shuttlecock. Very rarely, it may not grab a particular shuttle even after many attempts. If this happens, follow these steps:
    - Use the remote control to turn off the feeding mechanism
    - Turn off the main power button
    - If this is the last shuttle in the tube, the feathers might be pinched by the pressure of the ball, preventing the last shuttle from being pulled from the tube.
        - Remove the tube and reload to start another session.
    - Otherwise, verify and correct these points if applicable
        - Is the shuttle tube properly positioned in the holder? If the tube is not properly seated, correct this.
        - Is the weighted ball in place at the top of the stack of shuttles? This is especially important for the last few shuttles.
        - Is the problem shuttlecock in particularly bad condition? Remove the shuttlecock from use.
        - Does this happen repeatedly with the same shuttlecock? If so, remove that shuttlecock from use.
        - Does this happen repeatedly with a particular brand? If so, try shuttles of a different brand.

  - Remove the problem shuttle from the feeding tube to allow the next shuttle to descend
  - If the problem is more than occasional and persists after the above points are reviewed, please contact the vendor for support.

- **Cork breakage:** Cork breakage may occur either from a lot of wear, or as a result of weak cork material or construction on some shuttles, or from too much pressure from the ejections wheels. If cork breakage is happening prematurely, consider trying a different model or brand of shuttlecock, or slightly increasing the spacing between the ejection wheels. See the maintenance section for an explanation of how to adjust the spacing.

  Please also note that the Black Knight Truflight 3000 and 4000 nylon shuttlecocks will last longer with the Knight Trainer than some other popular brands of synthetic shuttles, and should be tried if cork separation is a problem with other nylon brands.

Ejection wheels and shot quality:
Two problems can arise with the ejection wheels, both of which can be dealt with as described in the maintenance section.

- Build-up on the wheels of residue from the cork covers – this can affect shot quality and consistency. Removing the residue, as described in the maintenance section, will solve this problem
- A change in the spacing between the wheels whether from a change in the blocking bolts or from wheel wear. In addition to affecting shot quality and consistency, if the wheels shift closer this can cause cork breakage. See the maintenance section for an explanation of how to adjust the spacing.

Angle locking knob:
Please refer to section 10 (Adjustments and Maintenance) if you experience problems with the angle locking knob.

Remote control:

- If the Knight Trainer is not responding to the remote control, try the following as necessary:
  - Make sure that the Knight Trainer is plugged in and that the power is on
    - The velocity and frequency digits will be illuminated and the ejection wheels will be spinning
  - Make sure that you are using the remote control with a line of sight to the round receiver window on the control box. Adjust your position, point towards the Knight Trainer accordingly, and try again
  - The remote control may have to be reprogrammed. Remove the shuttle tube and, with the Knight Trainer turned on, point the control at the receiver and depress the on button repeatedly until the feeding mechanism is activated.
  - Change the batteries in the remote control to ensure that you are sending a strong signal
  - You received 2 remote controls with your Knight Trainer – test with the spare remote.

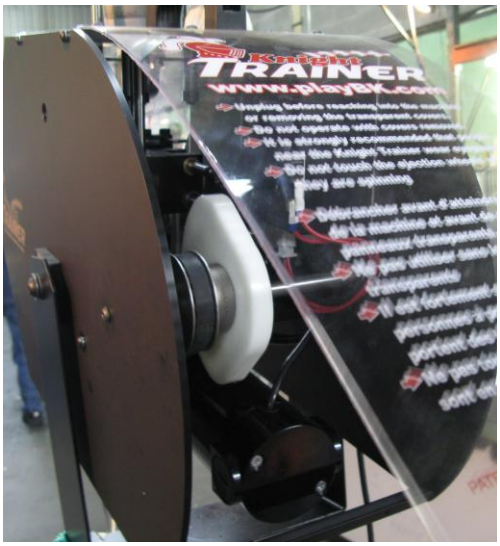
Continuous Operation:

- Overheating due to intense use or other factors may cause the Knight Trainer to shut down. However, the Knight Trainer is designed for heavy use and incorporates self-resetting circuit breakers into its circuit board.
  - If the feeding system stops on its own but the ejection wheels continue to spin, wait a moment and then restart the feeding with the remote control. If the remote control has no effect, refer to the preceding section.

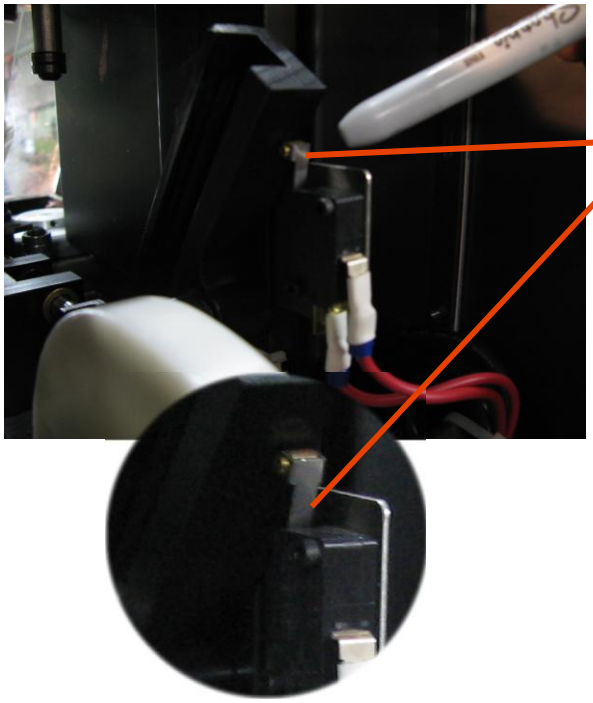
- If the feeding and ejection systems shut down, then turn the power switch off, wait a moment and then turn it on.
  - Repeat this a minute later if necessary
- If you cannot restart the systems, verify the connections of your plugs and then your power source.
- If the Knight Trainer is still not restarting, check the fuse on the control panel. It is found to the left of the on/off switch. Unscrew the cap and examine the fuse. If the fuse has burned out, the damage will be obvious and the fuse will have to be replaced.

Inconsistent changes in frequency and velocity:

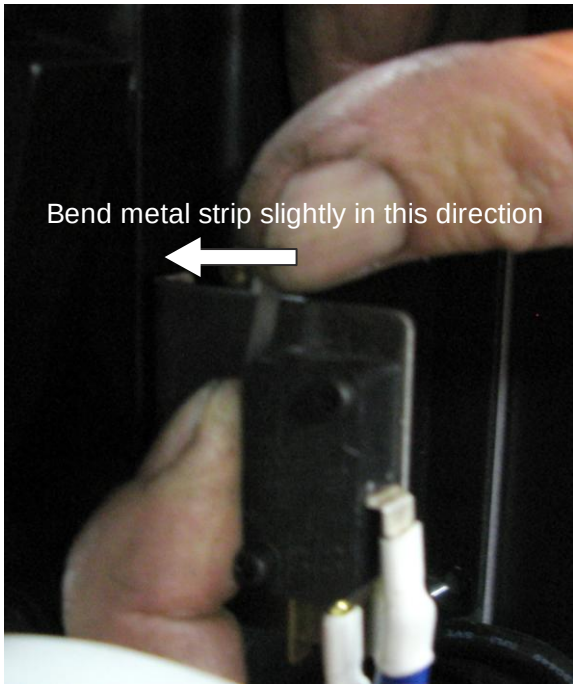
- If the Knight Trainer is not responding properly to the remote control it may be necessary to bend a contact switch at the back of the Knight Trainer:



Remove two screws from bottom of protective panel so that panel can be lifted.



Metal strip is contact for switch



- Test the Knight Trainer
- Adjust the metal strip again if necessary
- Secure the protective panel when finished with adjustments

If the problem has not been fixed, please contact the vendor.